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10/567,165	07/17/2008	Kazuhiko Terashima	04632.0067	4580

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EXAMINER	
NOLAN, PETER D	
ART UNIT	**PAPER NUMBER**
3661	
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01/20/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/567,165	TERASHIMA ET AL.
	Examiner	**Art Unit**
	Peter D. Nolan	3661

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 October 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

The amendment to the claims filed October 19, 2010 has been entered. Claims 1-3 remain pending.

Response to Arguments

Applicant's arguments filed October 19, 2010 with respect to the added claim limitation regarding determination of $a_i(f)$ and $b_i(f)$ “under a constraint condition that each maximum value in the transportation command does not exceed a limitation of a maximum value of the crane drive unit” have been fully considered but they are not persuasive.

The cited portions of Feddema teach the added claim limitation. In column 16, lines 22-24 of Feddema, it is stated that the coefficients a_i and b_i are determined by five variables, including a scaling factor, κ. As disclosed in column 16, lines 37-57 of Feddema, the scaling factor can be set such that the output of the IIR filter (equation 12) does not drive the trolley motors past the torque limits (i.e. each value of the transportation command does not exceed a limitation of a maximum value of the crane drive unit). Therefore, the coefficients a_i and b_i, which are determined, in part, by the scaling factor, are determined under the constraint condition.

Claim Objections

Claim 1 is objected to because of the following informality: the phrase “determined by under a constraint condition” should be corrected to “determined under a constraint condition”.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Habisohn (US 6102221) in view of Feddema et al. (US 5785191) and Bose (N. K. Bose, *Digital Filters Theory and Applications*. Malabar, Florida: Krieger Publishing Company, 1993.).

3. **Regarding claim 1**, Habisohn teaches a method for controlling a crane drive unit so as to suppress sway of a load suspended by a rope of a crane, which sway occurs when the load has been transported from a first position to a second position (**see Habisohn column 3, lines 29-32**), the control being made by operating a controller having a filter unit using a feedforward control program (**see Habisohn figure 2, Motor Controller 26 containing Damping Filter 40 and column 3, lines 13-28**), comprising: removing a component near a resonance frequency by the filter unit from a transportation command for the load (**see Habisohn column 5, line 66 thru column 6, line 5 and column 10, lines 6-27**), in which command a maximum value among at least one of a transportation speed, transportation acceleration, and transportation jerk is limited (**see Habisohn column 21, lines 39-54**), under the resonance frequency sequentially computed from a rope length that is a distance from the center of rotation of the sway of the rope to the center of gravity of the load (**see Habisohn column 7, lines**

34-44; column 10, lines 6-27; column 13, lines 46-54) and under parameters that relate to a control unit of the crane drive unit and that are previously computed so as not to exceed a performance of the crane drive unit (**see Habisohn column 21, lines 39-54**); and inputting the transportation command from which the component near the resonance frequency is removed into the crane drive unit, thereby controlling the crane drive unit so that the load does not greatly sway when the load is transported from the first position to the second position (**see Habisohn column 5, lines 37-49**).

However, Habisohn does not teach where, based on expression (1) or (2), the component near the resonance frequency is removed by using parameters $a_i(f)$ and $b_j(f)$, which are determined under a constraint condition that each maximum value in the transportation command does not exceed a limitation of a maximum value of the crane drive unit,

Expression (1)

$$y(t) = b_0(f)x(t) + b_1(f)x(t-1) + b_2(f)x(t-2) + \cdots - a_1(f)y(t-1) - a_2(f)y(t-2) - \cdots$$

$$y(t) = \sum_{j=0}^{m} b_j(f)x(t-j) - \sum_{i=1}^{n} a_i(f)y(t-i)$$

where $a_i(f)$ and $b_j(f)$ are parameters mediated by the resonance frequency f sequentially computed for the varying length of the rope, and

Expression (2)

$$F(S) = \frac{Y(S)}{X(S)} = \frac{b_0(f)S^0 + b_1(f)S^1 + b_2(f)S^2 + \cdots}{a_0(f)S^0 + a_1(f)S^1 + a_2(f)S^2 + \cdots} = \frac{\sum_{j=0}^{m} b_j(f)S^j}{\sum_{i=0}^{n} a_i(f)S^i}$$

where expression (1) is obtained by carrying out a Z-transformation to the transfer function of the filter shown in expression (2), and S is a Laplacian operator.

Feddema teaches a method for controlling a crane (**see Feddema Abstract**) where, based on expression (1), (**see Feddema column 16, equation 12 and lines 16-21**), a component near a resonant frequency is removed using parameters that are determined under a constraint condition that each maximum value in the transportation command does not exceed a limitation of a maximum value of the crane drive unit (**see Feddema figure 4; column 9, lines 27-43; column 11, lines 8-27; equation 12 and column 16, lines 16-57. In column 16, lines 22-24 of Feddema, it is stated that the coefficients a_i and b_i are determined by five variables, including a scaling factor, κ. As disclosed in column 16, lines 37-57 of Feddema, the scaling factor can be set such that the output of the IIR filter (equation 12) does not drive the trolley motors past the torque limits (i.e. each value of the transportation command does not exceed a limitation of a maximum value of the crane drive unit). Therefore, the coefficients a_i and b_i, which are determined, in part, by the scaling factor, are determined under the constraint condition**), where the parameters in expression (1) are mediated by the resonance frequency sequentially computed for the varying length of the rope (**see Feddema column 11, lines 8-27**) and where expression (1) is obtained by carrying out a Z-transformation to the transfer function of the filter shown in expression (2) and S is a Laplacian operator (**expression 2 is the transfer function of an Nth-order, linear and time invariant filter which has the filter output characteristic of equation 12 in Feddema**).

It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method in Habisohn with the filtering steps in Feddema because an infinite impulse response (IIR) filtering scheme, such as the one in Feddema, requires less hardware and can perform a filtering task with greater speed than other types of filters (**see Bose page 159**).

4. **Regarding claim 2**, Habisohn teaches a system for controlling a crane drive unit so as to suppress sway of a load suspended by a rope of a crane, which sway occurs when the load has been transported from a first position to a second position (**see Habisohn figure 2, motor controller 26 and column 5, lines 18-24**), the control being made by operating a controller having a filter unit using a feedforward control program (**see Habisohn figure 2, Motor Controller 26 containing Damping Filter 40 and column 3, lines 13-28**), comprising: a rope length detection unit for detecting a rope length that is a distance from the center of rotation of the sway of the rope to the center of gravity of the load (**see Habisohn figure 1, Rope Length Sensor 45 and column 5, lines 50-52**); a resonance frequency computing unit for computing a resonance frequency of the rope having said rope length (**see Habisohn column 5, lines 44-46; column 7, lines 34-44; column 13, lines 46-54**); a transportation command transmitting unit for transmitting a transportation command for the load given by a transportation command applicator (**see Habisohn figure 1, Motion Selector 34 and column 5, lines 33-34**); a parameter computing unit for previously computing parameters for a control unit of the crane drive unit so that the parameters do not exceed a performance of the crane drive unit (**see Habisohn column 21, lines 39-54**);

a parameter storing unit for receiving and storing the parameters from the parameter computing unit (**see Habisohn column 21, lines 39-54**); a maximum value limiting unit for limiting a maximum value among at least one of a transportation speed, transportation acceleration, and transportation jerk in the transportation command for the load from the transportation command transmitting unit under the parameters from the parameter storing unit (**see Habisohn column 21, lines 39-54**); and a filter unit for receiving the resonance frequency from the resonance frequency calculating unit, the filter unit removing a component near the resonance frequency from the transportation command in which the maximum value is limited by the maximum value limiting unit (**see Habisohn column 5, lines 44-46; column 7, lines 34-44; column 13, lines 46-54; column 21, lines 39-54**), under the parameters from the parameter storing unit, the filter unit inputting in the crane drive unit the transportation command from which the component near the resonance frequency is removed (**see Habisohn column 5, lines 37-49**),

However, Habisohn does not teach where based on expression (1) or (2), the component near the resonance frequency is removed by using parameters $a_i(f)$ and $b_j(f)$, which are determined in a simulation under a constraint condition that each maximum value in the transportation command does not exceed a limitation of a maximum value of the crane drive unit,

Expression (1)

$$y(t) = b_0(f)x(t) + b_1(f)x(t-1) + b_2(f)x(t-2) + \cdots - a_1(f)y(t-1) - a_2(f)y(t-2) - \cdots$$

$$y(t) = \sum_{j=0}^{m} b_j(f)x(t-j) - \sum_{i=1}^{n} a_i(f)y(t-i)$$

where $a_i(f)$ and $b_j(f)$ are parameters mediated by the resonance frequency f sequentially computed for the varying length of the rope, and

Expression (2)

$$F(S) = \frac{Y(S)}{X(S)} = \frac{b_0(f)S^0 + b_1(f)S^1 + b_2(f)S^2 + \cdots}{a_0(f)S^0 + a_1(f)S^1 + a_2(f)S^2 + \cdots} = \frac{\sum_{j=0}^{m} b_j(f)S^j}{\sum_{i=0}^{n} a_i(f)S^i}$$

where expression (1) is obtained by carrying out a Z-transformation to the transfer function of the filter shown in expression (2), and S is a Laplacian operator.

Feddema teaches a system for controlling a crane (**see Feddema Abstract; figure 1; column 8, lines 19-46**) where, based on expression (1), (**see Feddema column 16, equation 12 and lines 16-21**), a component near a resonant frequency is removed using parameters that are determined in a simulation under a constraint condition that each maximum value in the transportation command does not exceed a limitation of a maximum value of the crane drive unit (**see Feddema figures 1A and 4; column 9, lines 27-43; column 11, lines 8-27; equation 12 and column 16, lines 16-57. In column 16, lines 22-24 of Feddema, it is stated that the coefficients a_i and b_i are determined by five variables, including a scaling factor, κ. As disclosed in column 16, lines 37-57 of Feddema, the scaling factor can be set such that the output of the IIR filter (equation 12) does not drive the trolley motors past the torque limits (i.e. each value of the transportation command does not exceed a limitation of a maximum value of the crane drive unit). Therefore, the coefficients a_i and b_i, which are determined, in part, by the scaling factor, are determined**

under the constraint condition), where the parameters in expression (1) are mediated by the resonance frequency sequentially computed for the varying length of the rope (**see Feddema column 11, lines 8-27**) and where expression (1) is obtained by carrying out a Z-transformation to the transfer function of the filter shown in expression (2) and S is a Laplacian operator (**expression 2 is the transfer function of an Nth-order, linear and time invariant filter which has the filter output characteristic of equation 12 in Feddema**).

It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method in Habisohn with the filtering steps in Feddema because an infinite impulse response (IIR) filtering scheme, such as the one in Feddema, requires less hardware and can perform a filtering task with greater speed than other types of filters (**see Bose page 159**).

5. **Regarding claim 3**, Habisohn teaches a medium in which a feedforward control program is stored (**see Habisohn column 5, lines 53-58**), the feedforward control program controlling a crane drive unit by a controller having a filter unit so as to suppress sway of a load suspended by a rope of a crane, which sway occurs when the load has been transported from a first position to a second position (**see Habisohn column 3, lines 29-32. See also Habisohn figure 2, motor controller 26 containing filter unit 40 and column 5, lines 18-24**), the feedforward control program being programmed to cause the filter unit of the controller to remove a component near a resonance frequency from a transportation command for the load (**see Habisohn column 5, lines 44-46; column 7, lines 34-44; column 13, lines 46-54**), in which

command a maximum value among at least one of a transportation speed, transportation acceleration, and transportation jerk is limited (**see Habisohn column 21, lines 39-54**), under the resonance frequency sequentially computed from a rope length that is a distance from the center of rotation of the sway of the rope to the center of gravity of the load (**see Habisohn column 7, lines 34-44; column 10, lines 6-27; column 13, lines 46-54**) and under parameters for a control unit of the crane drive unit, which parameters are previously computed so as not to exceed a performance of the crane drive unit (**column 21, lines 39-54**), the feedforward control program being also programmed to cause the filter unit to input the transportation command from which the component near the resonance frequency is removed in the crane drive unit (**see Habisohn column 5, lines 37-49**).

However, Habisohn does not teach where based on expression (1) or (2), the component near the resonance frequency is removed by using parameters $a_i(f)$ and $b_j(f)$, which are determined by a simulation under a constraint condition that each maximum value in the transportation command does not exceed a limitation of a maximum value of the crane drive unit,

Expression (1)

$$y(t) = b_0(f)x(t) + b_1(f)x(t-1) + b_2(f)x(t-2) + \cdots - a_1(f)y(t-1) - a_2(f)y(t-2) - \cdots$$

$$y(t) = \sum_{j=0}^{m} b_j(f)x(t-j) - \sum_{i=1}^{n} a_i(f)y(t-i)$$

where $a_i(f)$ and $b_j(f)$ are parameters mediated by the resonance frequency f sequentially computed for the varying length of the rope, and

Expression (2)

$$F(S)=\frac{Y(S)}{X(S)}=\frac{b_0(f)S^0+b_1(f)S^1+b_2(f)S^2+\cdots}{a_0(f)S^0+a_1(f)S^1+a_2(f)S^2+\cdots}=\frac{\sum_{j=0}^{m} b_j(f)S^j}{\sum_{i=0}^{n} a_i(f)S^i}$$

where expression (1) is obtained by carrying out a Z-transformation to the transfer function of the filter shown in expression (2), and S is a Laplacian operator.

Feddema teaches a medium in which a feed forward control program for controlling a crane is stored (**see Feddema Abstract. See also figure 1 and column 8, lines 19-46 where the filter may be implemented in a digital signal processor and column 10, lines 61-64**) where, based on expression (1), (**see Feddema column 16, equation 12 and lines 16-21**), a component near a resonant frequency is removed using parameters that are determined by a simulation under a constraint condition that each maximum value in the transportation command does not exceed a limitation of a maximum value of the crane drive unit (**see Feddema figure 4; column 9, lines 27-43; column 11, lines 8-27; equation 12 and column 16, lines 16-57. In column 16, lines 22-24 of Feddema, it is stated that the coefficients a_i and b_i are determined by five variables, including a scaling factor, κ. As disclosed in column 16, lines 37-57 of Feddema, the scaling factor can be set such that the output of the IIR filter (equation 12) does not drive the trolley motors past the torque limits (i.e. each value of the transportation command does not exceed a limitation of a maximum value of the crane drive unit). Therefore, the coefficients a_i and b_i, which are determined, in part, by the scaling factor, are determined under the constraint**

condition), where the parameters in expression (1) are mediated by the resonance frequency sequentially computed for the varying length of the rope (**see Feddema column 11, lines 8-27**) and where expression (1) is obtained by carrying out a Z-transformation to the transfer function of the filter shown in expression (2) and S is a Laplacian operator (**expression 2 is the transfer function of an Nth-order, linear and time invariant filter which has the filter output characteristic of equation 12 in Feddema**).

It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method in Habisohn with the filtering steps in Feddema because an infinite impulse response (IIR) filtering scheme, such as the one in Feddema, requires less hardware and can perform a filtering task with greater speed than other types of filters (**see Bose page 159**).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this or any earlier communication from the examiner should be directed to Examiner Peter Nolan, whose telephone number is 571-270-7016. The examiner can normally be reached Monday-Friday from 7:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Thomas Black, can be reached at 571-272-6956. The fax number for the organization to which this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Peter D Nolan/

Examiner, Art Unit 3661

1/12/2010

/Thomas G. Black/

Supervisory Patent Examiner, Art Unit 3661